

CLAIMS

1. A spark plug comprising a nearly tubular insulator having an axial through hole and a first insulator stepped portion that reduces in an outer diameter toward a front end side, a rod-shaped center electrode disposed in the through hole of the insulator, a metallic shell having a first metallic shell stepped portion that reduces in an inner diameter toward a front end side and supporting the insulator through engagement of the first metallic shell stepped portion and the first insulator stepped portion by interposing therebetween a packing, and a ground electrode connected at an end to a front end surface of the metallic shell and facing at the other end portion toward the center electrode for thereby forming a spark discharge gap between said other end portion and the center electrode, characterized in that:

the insulator and the metallic shell, when observed in a section made by a plane including the axis of the spark plug, have therebetween a gap of less than 0.45 mm at a more front end side than an engagement position of the packing and the first insulator stepped portion; and

the gap is provided axially from a most front end side engagement position of the packing and the first insulator stepped portion as a starting point to a finishing point that is apart from the starting point by 1.2 mm or more toward the front end side while being apart from the front end surface of the metallic shell by 7.9 mm or more toward a rear end side.

2. A spark plug according to claim 1, characterized in that the gap is provided axially from the most front end side engagement position of the packing and the first insulator stepped portion as the starting point to a finishing point that is apart from the starting point by 1.5 mm or more toward the front end side while being apart from the front end surface of the metallic shell by 9.9 mm or more toward the rear end side.

10 3. A spark plug according to claim 1 or 2, characterized in that the insulator includes, at a more front end portion than the first insulator stepped portion, a second insulator stepped portion that reduces in diameter toward the front end side, the metallic shell includes, at a more front end side than the first metallic shell stepped portion, a second metallic shell stepped portion that increases in diameter toward the front end side, and the difference in outer diameter of the insulator between a front end and a rear end of the second insulator stepped portion is larger than the difference in inner diameter of the metallic shell between a front end and a rear end of the second metallic shell stepped portion.

25 4. A spark plug according to claim 3, characterized in that the second insulator stepped portion, when observed in a section made by a plane including the axis of the spark plug, forms an included angle of  $10^{\circ}$  or more with a line parallel with the axis.

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5. A spark plug according to claim 3 or 4,

characterized in that the rear end of the second insulator stepped portion is axially disposed at a more front end side than the front end of the first insulator stepped portion by an amount ranging from 1 to 6 mm.

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6. A spark plug according to any of claims 3 to 5, characterized in that the rear end of the second insulator stepped portion is axially apart from the front end surface of the metallic shell by 7 mm or more.

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7. A spark plug according to any of claims 3 to 6, characterized in that the rear end of the second insulator stepped portion, when observed in a section made by a plane including the axis of the spark plug, is axially apart from the rear end of the second metallic shell stepped portion as a starting point by an amount ranging from -0.5 to 3 mm wherein the amount apart from the starting point toward the front end side is designated by a positive value.

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8. A spark plug according to any of claims 1 to 7, characterized in that the packing is made of a material having a thermal conductivity of  $200\text{W/m}\cdot\text{k}$  or more.

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9. A spark plug according to any of claims 1 to 8, characterized in that a thread portion is formed on an outer circumferential surface of the metallic shell and the nominal designation of the thread portion is M12 or less.

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10. A spark plug according to claim 9, characterized

in that the axial length from a front end of the thread portion to the front end of the metallic shell is 2.5 mm or more.

5 11. A spark plug according to claim 10, characterized in that the distance from the front end of the metallic shell to the most front end side engagement position of the packing and the first insulator stepped portion is 2 mm or more.

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12. A spark plug according to any of claims 1 to 11, characterized in that the center electrode includes a first center electrode stepped portion increasing in outer diameter toward a rear end side, a center  
15 electrode minimum diameter portion connected to a rear end side of the first center electrode stepped portion, a second center electrode stepped portion connected to a rear end side of the center electrode minimum diameter portion and increasing in outer diameter  
20 toward a rear end side, and a center electrode maximum diameter connected to a rear end side of the second center electrode stepped portion, and the front end of the insulator is located between the first insulator stepped portion and the second insulator stepped  
25 portion when observed in a section made by a plane including the axis of the spark plug.